



# **NIOSH Traumatic Injury Research Program**

## **Plan to Implement the National Academies Program Evaluation Recommendations**

**April 19, 2010**

## Executive Summary

The National Institute for Occupational Safety and Health (NIOSH) Traumatic Injury Research Program underwent a systematic review for relevance and impact by the US National Academies (NA) beginning in 2007. The NA concluded in their 2008 report that the Traumatic Injury (TI) Research Program's efforts for the years 1996-2005 were in priority areas, and demonstrated effects on some end outcomes or well accepted intermediate outcomes, resulting in scores of 4 out of 5 for both relevance and impact. The NA review provided the following nine overarching recommendations for program improvement:

1. Continue setting goals that are within the TI Research Program's scope and resources.
2. Develop an explicit plan for each subgoal.
3. Work with other Federal agencies that support injury prevention and control research.
4. Improve surveillance of nonfatal injuries.
5. Work collaboratively with OSHA.
6. Ensure collaboration among NIOSH-funded researchers.
7. Increase the visibility of traumatic injury research.
8. Evaluate research-to-practice efforts.
9. Research prevention strategies for traumatic injuries in a changing workplace.

This implementation plan describes the NIOSH response to these overarching recommendations and the NIOSH Board of Scientific Counselors' review comments on the NA evaluation, centered primarily on their incorporation into the Strategic Plan for the NIOSH Traumatic Injury Research Program.

## Table of Contents

<b>Executive Summary</b> .....	2
<b>Introduction</b> .....	4
<b>NIOSH Plan to Implement the National Academies Program Review</b>	
<b>Recommendations</b> .....	6
Recommendation 1: Continue setting goals that are within the TI Research Program’s scope and resources.....	6
Recommendation 2: Develop an explicit plan for each subgoal.....	7
Recommendation 3: Work with other Federal agencies that support injury prevention and control research.....	8
Recommendation 4. Improve surveillance of nonfatal injuries.....	9
Recommendation 5. Work collaboratively with OSHA.....	10
Recommendation 6. Ensure collaboration among NIOSH-funded researchers.....	11
Recommendation 7. Increase the visibility of traumatic injury research.....	13
Recommendation 8. Evaluate research-to-practice efforts.....	14
Recommendation 9. Research prevention strategies for traumatic injuries in a changing workplace.....	16
<b>Appendix 1: NIOSH Traumatic Injury Research Program Strategic Plan ...</b>	19

## Introduction

Despite the fact that traumatic injuries are largely preventable, they remain a leading cause of death and disability among U.S. workers. NIOSH relies heavily on hazard, injury, and fatality surveillance to identify and track traumatic injury problems in specific worker populations, and to establish research priorities. On average, nearly 15 workers in the United States die each day from injuries sustained at work and an estimated 11,500 private-sector workers suffer a nonfatal work-related injury or illness, and more than half will require job transfer, work restrictions, or time away from their jobs as a result. More than 9,000 workers are treated in emergency departments each day, and approximately 200 of these workers are hospitalized. In 2006, workers' compensation costs for employers totaled \$88 billion.

## Mission Statement

The mission of the NIOSH Traumatic Injury (TI) research and prevention program is to reduce the incidence of traumatic occupational injuries and deaths through a focused program of surveillance, research and prevention. The program strives to fulfill its mission through the following:

- **High Quality, Peer-reviewed Research:** NIOSH applies the public health approach to identifying and addressing the most compelling traumatic injury risks facing workers across all sectors. Injury and fatality surveillance identifies, characterizes, prioritizes, and tracks injuries and fatalities; case investigations and analytic epidemiologic, social science, and engineering research discover risk and causal factors; protective technology research identifies, develops, and assesses prevention options; and intervention evaluation research determines program efficacy and effectiveness.
- **Practical Solutions:** The NIOSH traumatic injury research and prevention program is committed to the development of practical solutions to the complex problems that cause traumatic injuries and deaths among workers.
- **Partnerships:** Collaborative efforts in partnership with labor, industry, government, and other stakeholders are usually the best means of achieving successful outcomes. Fostering these partnerships is a cornerstone of the NIOSH traumatic injury research and prevention program.
- **Research to Practice (r2p):** One of the overarching goals of the NIOSH traumatic injury program is to conduct prevention-oriented research that leads to effective, practical prevention measures that can be implemented in workplaces. Every research project within the NIOSH traumatic injury research and prevention program includes a strategy to promote the transfer and translation of research findings into effective, feasible prevention practices, products, and technologies that can be adopted in the workplace.

## **National Academies Review and the TI Implementation Plan**

NIOSH considers the relevance of the Nation's occupational safety and health needs, conducting quality science, performing at a level that produces results, and being accountable for such values as important guiding principles. The NIOSH TI Research Program underwent a thorough external review in 2007 by the National Academies' (NA) Board on Population, Health, and Public Health Practice in Washington, DC. A committee of eleven experts, chaired by Brian L. Strom, of the University of Pennsylvania, School of Medicine reviewed an evidence package describing the previous decade's work by the NIOSH TI Research Program. The evidence package included both the goals and priorities used to drive recently completed research, along with new draft TI program strategic goals for the next decade. The NA committee used this information to determine program relevance to workplace issues and program impact on improvements in occupational safety. The committee also identified emerging issues the Program is facing. In addition to numerical scores for program relevance and impact (4 of 5 for both relevance and impact), the committee's report included 9 overarching recommendations for program improvements in the areas of strategic planning, coordination and collaboration, workforce development, transfer, and the changing nature of work. The evidence package and final NA report on the TI Research Program are available at <http://www.cdc.gov/niosh/nas/>. The NIOSH Board of Scientific Councilors (BSC) reviewed the NA evaluation and provided further input to the TI Program.

In response to the NA recommendations and the BSC comments, the NIOSH TI Research Program's Strategic Plan (Attachment I) was revised to create a more focused program of research and to incorporate the recommendations from the National Academies Program Evaluation. NIOSH is greatly appreciative of the thoughtful critique of and input to the Program and is confident that the incorporation of their suggestions will strengthen and improve the Nation's traumatic occupational injury prevention research.

The purpose of this Implementation Plan is to describe the TI Program efforts underway for responding to the NA recommendations. NIOSH looks forward to input from all stakeholders about these plans as well as all aspects of the program.

## **NIOSH Traumatic Injury Research Program plan to implement the National Academies recommendations**

### **Topic Area – Strategic Planning**

**Recommendation 1:** “Continue setting goals that are within the TI Research Program’s scope and resources. Given its limited resources, the TI Research Program should continue a research focus and priority setting on goals that are well defined, are based on rigorous surveillance data, and are complementary to work being done by stakeholders, extramural research partners, or other agencies.”

**Response:** Beginning in 2005, NIOSH developed and implemented a matrix management structure to coordinate cross-Institute programmatic activities. Traumatic Injury was identified as a cross-sector program in the new NIOSH Program Portfolio of 32 programs (8 Sector and 24 cross-sector programs). A NIOSH TI steering committee was formed to develop strategic goals for conducting NIOSH TI research. This committee, with representatives from Divisions and Labs across the Institute, developed the following research goals for the future which were presented to the NA review committee for their input:

- Reduce fall injuries in the workplace
- Reduce occupational injuries and deaths due to motor vehicles
- Reduce occupational injuries and deaths due to workplace violence
- Reduce occupational injuries and deaths due to machines and industrial vehicles
- Reduce occupational injuries and deaths among high-risk and vulnerable work groups

In response to the collective comments and recommendations from the NA Review Committee, the NIOSH T I Research Program revised the TI Strategic Plan and research goals (Attachment I). The NIOSH TI Research Program has always been committed to the rigorous collection and analysis of surveillance data to drive TI research goals and program priorities. To further strengthen and focus this commitment, a comprehensive set of surveillance goals was developed and added as Strategic Goal 6, including 15 specific Activity/Output goals to improve work-related traumatic injury surveillance. In developing and modifying these goals we took into consideration the strengths and areas of expertise of NIOSH staff, as well as extramural research in these goal areas, to focus on activities most appropriately conducted by NIOSH. The NIOSH TI Research Program will use the enhanced surveillance goals, along with additional modifications and additions to the strategic plan described in following sections, to drive our research project planning and development.

Most new NIOSH research to address Program goals is funded through an Institute-wide competitive process. NIOSH is currently examining the process by

which intramural funds are allocated across the Institute with the intent of developing a more efficient system. The NORA Office has conducted a “360 review” of the NORA intramural competitive process by which new research in NIOSH is funded. Meetings have been held at all locations across the Institute, seeking input from management and scientists. The NIOSH Science Lead Team is also compiling comments and responses regarding concerns and possible solutions relating to the NORA competition process. This input is being used to refine the process by which NIOSH allocates funding for intramural research

**Recommendation 2:** “**Develop an explicit plan for each subgoal.** The TI Research Program should develop an explicit, written plan within each subgoal for progression along the public health framework, including the circumstances under which work in the subgoal should cease. Additional considerations should be the relative balance between risk factor and intervention research.”

**Response:** Goal development: Subgoals and associated Activity/Output Goals have been developed for each Strategic Goal (see Appendix 1). The Activity/Output Goals focus on the phases of the public health framework that are needed to accomplish the specific goal. For example, strategic goals where little research and prevention progress has been made (e.g., Reduce occupational injuries and deaths among high risk and vulnerable work groups) activity goals begin with surveillance and risk characterization, and follow through the stages of the public health model to intervention research and transferring results to practice. In more mature areas where the risks are known and prevention strategies have been developed (e.g., Reduce falls in the health services industry) activity goals address later stages of the public health framework such as implementing and evaluating “best practices” prevention measures. The TI goals will be posted to the NIOSH web for input and feedback from partners and stakeholders. The goals and subgoals will be reviewed and revised as appropriate, including the removal of subgoals that have been accomplished (by NIOSH or others) or are otherwise no longer among the most important priorities. Further, the TI Program is finalizing an effort to identify the highest priority Activity/Outcome Goals on which to focus intramural research proposals in the forthcoming planning cycle.

Research project development: The programmatic process for initiating and conducting most new NIOSH research to address Program goals is an Institute-wide competitive process open to proposals focused on any of the 32 Sector and Cross-sector Programs in the NIOSH program portfolio. Successful new project proposals must address program goals and be scored highly by external peer reviewers. The TI Research Program goals were developed to guide project planning towards the highest priority, data-driven needs within the context of this process. The process by which NIOSH allocates funding for intramural research is in the process of being reviewed and refined to enhance our ability to address program goals.

Moreover, the TI Steering Committee has been empowered to mold activities in TI through its ability to participate in the review and ranking of Letters of Intent submitted in the initial stages of this funding competition. The Steering Committee has also been empowered to review all in-house projects relevant to TI on an annual basis and provide feedback to divisions about each project's relevance, progress, and continuation.

There has also been a recent shift in emphasis in the TI Research Program, reducing risk factor research and increasing intervention evaluation research. This was a natural transition in the NIOSH process of focusing Sector and Cross sector Program research on the most important problems and achieving the greatest impact with scarce resources. In fact, there are many interventions in various stages of development that have potential for immediate impact on prevention. The risk factors for most of the biggest occupational injury problems (see TI strategic goals) are already well known, and in many cases promising interventions have also been identified. Focusing on intervention evaluation allows us to determine and document effectiveness, including cost effectiveness, of existing solutions, and transfer results into the workplace where they can begin to affect injury reduction. With this focus, the NIOSH TI research program has gained expertise and experience in working effectively in partnership with industry to conduct intervention evaluation research. As the success stories of these partnerships have spread, the value to industry partners has become apparent, and implementation of resulting prevention strategies has been realized; the opportunities for conducting such studies and for implementing effective interventions in work places have increased. These efforts also facilitate the ability of the TI Program to demonstrate direct program impact.

## **Topic Area –Coordination and Collaboration**

**Recommendation 3:** “**Work with other Federal agencies that support injury prevention and control research.** NIOSH and its TI Research Program should work with senior leadership from other Federal agencies to outline areas of collaboration and synergy; to identify opportunities to further the science of injury control and prevention; and to reduce the burden of injury across populations, environments, and products.”

**Response:** One of the standard practices of NIOSH's TI Research Program is to engage relevant partners and stakeholders throughout the research process, from conceptualization and protocol development, to dissemination and transfer of results. This collaborative approach ensures that results will be relevant to current needs and acceptable to those who can implement them, and promotes shared ownership by those who can transfer and adopt prevention findings in the workplace.



The NIOSH TI Research Program has a long history of working collaboratively with other Federal agencies, including the Occupational Safety and Health Administration (OSHA), the Consumer Product Safety Commission (CPSC), the Department of Agriculture, the Department of Labor Wage and Hour Division, the Bureau of Labor Statistics, and the US Fire Administration. More recently, the TI Research Program has also developed working relationships with the Department of Transportation, the Federal Motor Carriers Safety Administration, the National Highway Traffic Safety Administration, Veterans Administration, and the Department of Homeland Security. While only a few of these federal partners provide direct funding to NIOSH TI research, their collaborative efforts of contributing data, expertise, science, and translation activities toward the accomplishment of shared strategic goals leverage the resources aimed at the TI research goals and research-to-practice efforts.

To ensure TI research continues to build and strengthen these interagency collaborations, the TI Research Program leadership took this recommendation into consideration in the revision of the TI strategic goals, and included specification to working collaboratively with other Federal agencies in Activity/Output goals. Twenty Intermediate goals or Activity/Output goals specifically call for working with Federal agency collaborators.

In addition to working with other Federal agencies, the NIOSH TI Research Program also seeks opportunities to work with other research organizations in the U.S. (e.g., Liberty Mutual Research Institute for Safety) and International agencies (e.g., Finnish Institute of Occupational Health) with similar missions.

The TI program has also established numerous successful research partnerships with industry, a number of which are providing funding. For example, Sikorsky Aircraft Corporation has committed substantial resources to support NIOSH research to document the effectiveness and return on investment of safety interventions implemented in their industry, and seven international truck manufacturing partners have contributed funding to an anthropometric study of truck drivers that will provide data for safer truck cab designs. Drawing on the experiences of these successful partnerships, the TI program will continue to seek out similar collaborations to leverage industry resources to address TI goals.

All NIOSH research projects require specification of partners and collaborators. TI Research Program management reviews all new research proposals as part of the competitive funding process, and reviews ongoing research projects on an annual basis. In response to this recommendation, TI Research Program management will heighten efforts to ensure coordination with relevant Federal agencies as well as other stakeholders in our research activities.

**Recommendation 4:** “**Improve surveillance of nonfatal injuries.** The TI Research Program should develop a plan for improving surveillance of nonfatal

injuries, integral to prevention and to strengthening the TI Research Program portfolio development. A comprehensive approach should go beyond use of employer-based data sources to include non-employer based data sources such as hospital data and other medical data systems, the National Health Interview Survey, and the Behavioral Risk Factor Surveillance System. The TI Research Program should involve other relevant Federal and state agencies in developing a cohesive interagency effort.”

**Response:** The TI Research Program has historically focused its limited resources on the leading causes of fatal injuries as the “tip of the iceberg.” The collective efforts of the NIOSH TI Research Program and others have led to substantial reductions in the number of occupational fatalities occurring each year, and as fatalities continue to decrease, resources are beginning to shift toward nonfatal injuries. A new surveillance Strategic Goal has been added to the Revised TI Strategic Plan to address the need for increased and improved nonfatal injury and hazard surveillance. Strategic Goal 6 “Increase the Use of Surveillance Data to Guide Occupational Traumatic Injury Research and Prevention Efforts” includes 15 specific activity and output goals addressing the surveillance of fatal and nonfatal injuries, and denotes Federal and state agency partners and collaborators needed to accomplish the goals. Responsive to this recommendation, NIOSH has initiated new research to examine underreporting of occupational injuries and illnesses by assessing the ability of emergency department records to identify self-employed workers and other groups that may be underreported in existing surveillance systems, and is conducting survey research to identify and quantify barriers to workers reporting occupational injuries. NIOSH is working with the Bureau of Labor Statistics and Council of State and Territorial Epidemiologists’ Occupational Health Workgroup on this fundamental work that can serve as the basis for more comprehensive future studies.

**Recommendation 5:** “**Work collaboratively with OSHA.** An agency of particular importance and relevance to NIOSH is OSHA. The TI Research Program, along with NIOSH leadership, should continue to work with OSHA to identify areas of high-priority research that NIOSH should undertake and to identify NIOSH research findings of particular salience for potential regulatory action by OSHA.”

**Response:** NIOSH has a long history of working with OSHA, and the TI Research Program is attentive to OSHA’s safety activities and regularly provides input into OSHA proposed rulemaking and guidelines. An OSHA-NIOSH monthly seminar series provides a forum for interdisciplinary discussion among OSHA and NIOSH staff of the evolving science of health and safety. Monthly meetings by teleconference focus on presentations intended to improve the ability to critically review the methodology, regulatory, research, ethical, or health issues raised by a specific topic of mutual interest.

NIOSH and OSHA's Directorate of Technical Support and Emergency Management have also initiated the "NIOSH-OSHA Liaison & Information Exchange" - a series of monthly phone calls with NIOSH and OSHA to discuss and advance our collaborative activities at the staff level. This forum, chaired and supported by agency leadership, provides for NIOSH and OSHA to add items to a monthly agenda on which to seek input from or collaboration with each other in priority areas, including authoritative recommendations and rulemaking. Collaboration and co-commitment of resources on topics for authoritative recommendations or other collaborative efforts depend in part on OSHA's receptivity and competing priorities.

In addition NIOSH has recently established an institute level research agenda on proposed OSHA regulations and regulatory changes which identifies areas of high-priority research that NIOSH should undertake along with NIOSH research findings for potential regulatory action by OSHA. This NIOSH regulatory agenda is posted on the NIOSH website at: <http://www.cdc.gov/niosh/regulatory.html>.

To strengthen direct communication and collaboration between The TI Research Program and OSHA, the NIOSH TI Research Program management and research staff hosted a meeting in September with management and staff of the OSHA Directorate of Construction (DOC) to discuss current research efforts and topics of mutual interest for potential collaboration. This led to the establishment of quarterly meetings of TI program and DOC staff to further solidify OSHA/NIOSH cooperation and collaboration in areas of mutual priority, and to enhance the translation of scientific findings into standards and guidance.

NIOSH has also recently established an Office of Construction Safety and Health within the Office of the Director, with a primary purpose of liaising with the OSHA Directorate of Construction to work towards common injury and illness prevention goals in the construction sector.

To ensure TI research continues to build and strengthen collaboration with OSHA in the specific area of injury prevention, the TI Research Program leadership enhanced the TI strategic goals and program planning guidance to incorporate specification to working collaboratively with OSHA on thirteen relevant Activity/Output goals.

**Recommendation 6:** "Ensure collaboration among NIOSH-funded researchers. NIOSH should review its practices and take steps to improve the opportunities for intramural and extramural researchers, including state occupational public health programs, to communicate and collaborate without excessively directing extramural research to the detriment of scientific creativity. NIOSH should also further ensure collaboration and coordination among its programs, including the traumatic injury, construction, mining, and agriculture programs."

**Response:** NIOSH leadership is working to strengthen collaborations between intramural and extramural scientists and has taken steps to facilitate and improve the coordination and collaboration of intramural and extramural research. An Office of Extramural Program staff representative has been assigned to each of NIOSH's Sector and Cross sector Program steering committees, including the TI Research Program steering committee, which also helps to connect intramural and extramural work in each Program area.

In addition, the NIOSH TI Research Program has an extremely productive intramural - extramural collaboration in the Fatality Assessment and Control Evaluation (FACE) program that serves as a model for effective Federal cooperative agreements. This cooperative agreement between the TI Research Program and State health and labor departments conducts epidemiologic field investigations of selected fatal occupational injuries. Reports of each investigation, by NIOSH in-house FACE staff and by all cooperating States, are posted to the NIOSH website in a searchable database. NIOSH staff collaborate with State-FACE investigators on to develop and disseminate prevention recommendations and products, and to facilitate partnerships to implement recommendations through State-level organizations and legislation. This cooperative agreement has led to numerous partnership outcomes such as the development and adoption of case-based worker safety training, new and revised safety standards, state legislation to improve safety, manufacturing changes to make products and equipment safer, and changes in industry safety policy and practices.

One of the most effective mechanisms the TI Research Program uses to facilitate intramural - extramural collaboration and information sharing is the National Occupational Injury Research Symposium (NOIRS). On an approximate 3-year cycle (the typical grant cycle), the TI Research Program hosts the NOIRS to provide a forum for intramural and extramural researchers to present their latest research studies, methods, and findings related to traumatic occupational injuries and share their work with others. NOIRS brings together researchers from a broad range of disciplines to discuss research in progress and to form research and prevention partnerships. NOIRS is the only National forum focusing specifically on traumatic occupational injury research and thus is well attended by the foremost researchers in the field. It has become clear from presentations at the most recent symposium (October, 2008) that NOIRS has facilitated research partnerships, as well as the initiation of new research that builds on previously presented methods and results by both NIOSH and extramural scientists. The TI program has announced plans for the next NOIRS conference to be held in Morgantown West Virginia in October 2011.

Additionally, NIOSH scientists are permitted to spend up to 5% of their time to work collaboratively with extramural grantees on research grants. To facilitate this collaboration, potential grantees can request NIOSH scientists be included

as part of the research team in grant proposals submitted for funding. The TI research program encourages appropriate NIOSH staff to work on relevant research grants that address TI strategic goals. TI program research staff are currently working directly with extramural research partners on several collaborative projects, particularly in the areas of violence and machine safety.

To ensure TI research continues to build and strengthen collaboration with intramural and extramural researchers, the TI Research Program leadership included specific guidance to work collaboratively with other NIOSH Programs, as well as with states and other extramural researchers, in the revision of the TI strategic goals. In addition, all of the Sector Program goals addressing traumatic injury were reviewed and considered in the revised TI Strategic Plan. Corresponding Sector goals are cross-walked with the TI goals and denoted in the TI Strategic Plan. This facilitates recognition that research addressing specific TI goals is also addressing similar Sector goals, and promotes collaboration between Programs.

In addition to working with other researchers, the TI Program has a long-standing practice of engaging non-research partners in collaborative studies. Industry, interest groups and worker organizations are often engaged in the research process to help ensure relevance and assist in translating results to practice.

## **Topic Area – Workforce Development**

### **Recommendation 7: “Increase the visibility of traumatic injury research.**

NIOSH should embark on a program to increase the visibility of traumatic injury research in order to attract new researchers. Absent a significant increase in research funding, the TI Research Program can still attempt to influence the number of ERCs that have a focus on safety research and can still disseminate information about the quality, impact, and scientific challenges of traumatic injury research, as well as the dynamic changes in the field that go beyond the confines of traditional safety engineering.”

**Response:** NIOSH supports 17 Education and Resource Centers (ERCs), each with different levels of emphasis in the core areas of industrial hygiene, occupational health nursing, occupational medicine, and occupational safety. Although occupational injury epidemiology and injury intervention evaluation research are not emphasis areas at all of the NIOSH ERCs, these core areas are encouraged by NIOSH and emphasized at several of the NIOSH-funded ERCs. NIOSH’s Division of Safety Research recently successfully recruited a PhD injury epidemiologist through the Centers for Disease Control and Prevention’s Epidemic Intelligence Service (EIS) program who received her doctoral training through a NIOSH traineeship program – testimony to the potential effectiveness of using this mechanism to ‘develop the pipeline’ of occupational injury epidemiologists. Additionally, NIOSH supports 9 Training Project Grants that provide graduate training specifically in occupational safety.

The TI Research Program also uses other intern and fellowship programs such as the Association of Schools of Public Health (ASPH) fellowship program, CDC EIS program, Hispanic-Serving Health Professions Schools (HSPHS), Hispanic Association of Colleges and Universities (HACU), and Project IMHOTEP (which provides interns from various minority ethnic groups). These programs allow us to provide students and recent graduates with exposure, training and experience in the areas of occupational injury surveillance and epidemiology. A number of these fellowship and internship opportunities have led to careers in this field, within NIOSH and elsewhere. The TI Research Program firmly embraces the concept and practice of supporting these efforts to nurture the pipeline of occupational injury prevention researchers.

The NIOSH Office of Extramural Programs is preparing to collect information to assess the need for occupational safety and health professionals. The survey will assess the needs of the NIOSH workforce as well as the nation's current and future needs for occupational safety and health professionals to provide guidance to NIOSH planning in this area.

## **Topic Area – Transfer**

**Recommendation 8:** “**Evaluate research-to-practice efforts.** NIOSH should develop a strategic plan for evaluating its r2p efforts and for building the capacity to carry out and evaluate these efforts. Needed disciplines include behavioral sciences; organizational behavior; intervention effectiveness research; public health education; dissemination, implementation, and diffusion research; social marketing; and media advocacy.”

**Response:** The TI Research Program has played a lead role in facilitating the transfer of NIOSH research results to workplace practice, and embracing that responsibility as part of our research. For each TI research project, we identify at least one “recipient” of the findings (e.g., translators of scientific information to worker-friendly guidance or training materials; regulators to promulgate new safety policy; consensus standard bodies to develop or modify guidelines and voluntary standards; trade and labor organizations to promote new health and safety practices; manufacturers to develop and market safety technologies; and companies to implement new safety technologies, processes and practices). TI project officers involve relevant stakeholders or “recipients” throughout the research process, from conception to implementation of results. This not only helps to ensure that the outputs will be relevant and acceptable, but also promotes shared ownership and buy-in by stakeholders who can implement them in the workplace or move them towards workplace practice. For example, in the TI project to improve the safety of fall protection harnesses, harness manufacturers partnered with NIOSH throughout the project and are now producing and marketing safer harnesses. In many TI projects, such as those aimed at developing safer ambulances and safer protective eyewear, NIOSH

worked directly with standards setting bodies that use the results to develop or improve voluntary safety standards. In other areas such as injury prevention among firefighters and among healthcare workers, industry partners collaborated with project staff in the research projects and ultimately implemented effective prevention findings in their workplaces. To ensure TI research continues to include and strengthen r2p efforts in accomplishing TI goals, the TI Research Program leadership took this recommendation into consideration in the revision of the TI strategic goals, and included specific r2p Activity/Output goals for every strategic goal. Thirty-two TI Activity/Output goals specify r2p activities.

A number of steps have been taken to institutionalize r2p in NIOSH, including the establishment of the Office of Research to Practice (r2p office) and a new position in the NIOSH Office of the Director. New and enhanced Institute-wide r2p-related policies, processes, and practices are currently being established under this new leadership. In addition, an Institute-level effort to establish a program of translational research, including r2p evaluation, is currently under development. The TI Research Program will interact with the r2p office and participate in the r2p research program to enhance r2p activities in the TI Research Program.

The NIOSH project planning process now requires that all research project proposals include a relevant plan for transferring project results to practice or to the next phase along the research-to-practice continuum. This process is being assessed and modified by the NIOSH OD to improve project r2p plans and the ability to assess impact. Currently, project r2p plans are reviewed and approved by the r2p office prior to funding. TI management also reviews these proposals and their r2p plans to ensure staffing capacity for the responsibility of transferring results. The project planning system has also recently been modified to document and track both outputs and related outcomes of each research project. These outcomes, related to specific products of the research, are indicative of the effectiveness of r2p efforts. This new tracking mechanism allows us to systematically document program impact and identify and assess efficient and effective transfer methods.

The TI Research Program includes a well-established and productive research emphasis on intervention evaluation. Recent evaluation efforts have included best practice programs for safe patient handling in nursing homes and hospitals, and slips, trips and falls prevention in hospitals. Current efforts include intervention evaluations of slips, trips and falls in food service and manufacturing settings, and violence prevention in the retail, taxi, and psychiatric hospital industries. Although the scientific evaluation of r2p strategies per se is beyond the current scope of expertise and resources of the intramural TI program, the NIOSH extramural program supports efforts to improve the body of knowledge for r2p application. The TI Program will interact with and learn from such efforts when possible. In addition to working with extramural partners and with the NIOSH r2p office, the TI program will continue to study and learn from the

growing body of research on effective methods of diffusion, social marketing, and transfer, and will apply that new knowledge in our r2p efforts.

## **Topic Area – The Changing Nature of Work**

**Recommendation 9: “Research prevention strategies for traumatic injuries in a changing workplace.** The TI Research Program should consider research on the safety impacts of changes in the nature of work as well as intervention research targeting organization policies and practices and including prevention through design approaches.”

**Response:** Maintaining optimal relevance and impact of our research program also depends in part on the ability to detect and address changes and emerging issues. The TI Research Program utilizes extensive surveillance to monitor the changing nature of the demographics of the workforce as well as injury and fatality trends. The analysis and interpretation of this surveillance data helps identify emerging issues and new hazards as well as priority areas for research. The FACE and Firefighter field investigation programs complement surveillance efforts by collecting more details about the hazards and circumstances of fatal injuries. NIOSH publishes reports describing these fatality incidents and providing recommendations specific to policies and practices that can play a role in injury prevention. Several extramural research projects also address this issue and several intramural research projects that specifically aim to evaluate the role of organizational policies and practices in injury prevention are in the competitive proposal process.

The TI Research Program maintains dedicated projects that are specifically designed to respond to emerging issues in the areas of surveillance, causality, and evaluation. Modest resources are allocated to these projects annually to address newly detected areas of concern or serendipitous partnership opportunities. Moreover, the strong engagement with stakeholders and partners in the TI Research Program, as well as the National Occupational Injury Research Symposia, not only provide opportunities to learn of changing and emerging issues, but to adapt partnership efforts to address them.

In addition, the FACE investigation program with its cooperative intramural and extramural State-based components is designed to be flexible and adaptable to emerging hazards and changing priorities. For example, with the rapid growth of the telecommunication industry, we began to see a spike in deaths due to falls from towers during construction and maintenance. The FACE Program not only adapted to investigate these incidents, but also collaborated with industry to develop prevention efforts. When surveillance data showed high fatality rates among Hispanic workers, the FACE Program shifted priorities to begin investigating Hispanic worker fatalities. In 2010, the FACE program is shifting targets to investigate the high risk and emerging issues of: falls in residential and commercial construction, including renovation and maintenance; machinery, with



emphasis on construction, manufacturing and mobile equipment; foreign-born workers; and energy production industries with expanding activity, including oil and gas and green energies. Additionally, the intramural FACE program will continue limited investigation of fatalities to working youth for circumstances not covered by Wage and Hour Hazardous Orders, and each State cooperating in the FACE Program has the flexibility to address high-risk issues specific to their State in addition to the current program investigation targets.

The changing nature of work is also addressed in TI Strategic Goal 5: “Reduce occupational injuries and deaths among high risk and vulnerable worker groups.” In response to this NA recommendation, this goal was modified and expanded to include not only young workers, older workers, Hispanic workers, and immigrant workers, but also foreign-born workers, workers with physical disabilities, day workers, small and medium sized enterprises (SMEs), and groups with injury rates that are increasing over time. Intramural projects proposals addressing some of these hard-to-reach groups are in the competitive process pipeline. In addition, the new TI Strategic Goal 6 – “Increase the use of surveillance data to guide occupational traumatic injury research and prevention efforts” - includes Activity/Output goals that will enhance our capacity to recognize and track changing injury patterns. These Activity/Output goals also specifically call for partnering with other Federal agencies including OSHA, with states, with grantees through the NIOSH Office of Extramural Programs, and with other sector and cross sector programs, including the occupational health disparities program. The TI Research Program will continue to strengthen our interaction and collaboration with NIOSH cross sector programs such as Work Organization and Stress-Related Disorders, Occupational Health Disparities, and Prevention through Design.

Prevention through design has been a long-standing, integral component of the TI Research Program. The Protective Technology Branch of the Division of Safety Research has as its central focus the identification and development of safety technology to “design out” workplace safety hazards. In response to this recommendation, specific prevention through design goals have been incorporated into 16 Intermediate and Activity/Output goals throughout the revised TI strategic plan.

There has also been a recent shift in emphasis in the TI Research Program, to increase intervention evaluation research. Most of the TI intervention trials evaluate interventions that are part of a comprehensive “best practices” program that includes organizational policies and practices. For example, recent evaluations of “best practices” intervention programs for safe patient handling in nursing homes, and to prevent slips, trips and falls in hospitals, have both won prestigious scientific awards, including the annual Alice Hamilton award. In addition to publishing results in the peer-reviewed literature, whenever feasible the TI program also produces NIOSH publications targeted to the appropriate industry audience that describes the business case and provides guidance on

how to implement effective interventions in the workplace. Intervention evaluation research, including evaluation of organizational policies and best practices, is an area in which the NIOSH TI Research Program plans to continue to expand its efforts, as indicated throughout the revised TI strategic plan.

## APPENDIX I

### NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH STRATEGIC PLAN FOR THE TRAUMATIC INJURY RESEARCH PROGRAM August 7, 2009

#### *Mission Statement:*

The mission of the NIOSH traumatic injury (TI) research and prevention program is to reduce the incidence of traumatic occupational injuries and deaths through a focused program of surveillance, research and prevention. The program strives to fulfill its mission through the following:

- **High Quality Research:** NIOSH applies the public health approach to identifying and addressing the most compelling traumatic injury risks facing workers across all sectors. Injury and fatality surveillance identifies, characterizes, prioritizes, and tracks injuries and fatalities; case investigations and analytic epidemiologic, social science, and engineering research discover risk and causal factors; protective technology research identifies, develops, and assesses prevention options; and evaluation research determines program and intervention efficacy.
- **Practical Solutions:** The NIOSH traumatic injury research and prevention program is committed to the development of practical solutions to the complex problems that cause traumatic injuries and deaths among workers.
- **Partnerships:** Collaborative efforts in partnership with labor, industry, government, and other stakeholders are usually the best means of achieving successful outcomes. Fostering these partnerships is a cornerstone of the NIOSH traumatic injury research and prevention program.
- **Research to Practice (r2p):** Our research must be prevention oriented and lead to effective, practical prevention measures that can be implemented in workplaces. Every research project within the NIOSH traumatic injury research and prevention program includes a strategy to promote the transfer and translation of research findings into effective, feasible prevention practices, products, and technologies that will be adopted in the workplace.

### ***Background of the TI Research Program:***

Definition and scope of the program area: Traumatic occupational injury is defined as any damage inflicted to the body by energy transfer during work with a short duration between exposure and the health event. Traumatic injuries at work remain a leading cause of death and disability among U.S. workers. NIOSH relies heavily on hazard, injury and fatality surveillance to identify and track traumatic injury problems in specific worker populations, and to establish research priorities. On average, nearly 15 workers in the United States die each day from injuries sustained at work. Daily, an estimated 11,500 private-sector workers have a nonfatal work-related injury or illness, and more than half will require job transfer, work restrictions, or time away from their jobs as a result. More than 9,000 workers are treated in emergency departments each day, and approximately 200 of these workers are hospitalized. In 2006, workers' compensation costs for employers totaled \$88 billion.

### **Fatal Occupational Injuries**

There were 5,703 fatal work injuries in the United States in 2006, down slightly from the revised total of 5,734 fatalities in 2005. The rate of fatal work injuries in 2006 was 3.9 per 100,000 workers, down from a rate of 4.0 per 100,000 in 2005.

Fatalities: Tables 1 and 2 present the Number and Rate per 100,000 Workers (respectively) of Fatal Occupational Injuries by Industry Sector for 2004 and 2005

*Table 1. Number of Fatal Occupational Injuries by Industry Sectors—2004, 2005*

Industry Sector	Number of Fatal Injuries	
	2004	2005
Services	1518	1494
Construction	1268	1238
Transportation, Warehousing and Utilities	931	967
Agriculture, Forestry, and Fishing	663	718
Wholesale and Retail Trade	576	602
Manufacturing	459	394
Mining	152	159
Healthcare and Social Assistance	131	119
<b>Total</b>	<b>5698</b>	<b>5691</b>

**Source:** BLS Census of Fatal Occupational Injuries ([www.bls.gov/iif](http://www.bls.gov/iif))

*[Notes: Industry was unknown for 5 fatalities. Government workers are distributed across the sectors according to the industry of the agency.]*

*Table 2. Rate of Fatal Occupational Injuries by Industry Sectors—2004, 2005*

Industry Sector	Rate of Fatal Injuries (# per 100,000 workers)	
	2004	2005
Agriculture, Forestry, and Fishing	28.0	31.6
Mining	23.4	25.5
Transportation, Warehousing and Utilities	12.8	13.1
Construction	11.8	11.1
Wholesale and Retail Trade	2.9	2.8
Manufacturing	2.6	2.4
Services	2.5	2.2
Healthcare and Social Assistance	0.9	0.7

**Source:** BLS Census of Fatal Occupational Injuries ([www.bls.gov/iif](http://www.bls.gov/iif))

*[Notes: Industry was unknown for 5 fatalities. Fatalities associated with events or exposures of bodily reaction and exertion (8) and other events or exposures (3) were excluded from the event categories. Government workers are distributed across the sectors according to the industry of the agency.]*

### **Nonfatal injuries**

The Bureau of Labor Statistics (BLS) estimated that there were 3.8 million nonfatal occupational injuries in 2007 occurring at a rate of 4 cases per 100 full-time equivalent workers. Of these injuries, 30% were attributed to goods producing industries and 70% were attributed to service providing industries. The top three industries in the nonfatal injury distribution were manufacturing (19%), health care and social assistance (17%), and retail trade (15%). The BLS data are based on a survey of employers that excludes an estimated 22% of US workers, including the self-employed, private household workers, farms with fewer than 11 employees, and government employees.

To help fill gaps in data on nonfatal occupational injuries, NIOSH conducts: 1) surveillance of occupational injuries and illnesses treated in a nationally-representative sample of hospital emergency departments through a work supplement to the National Electronic Injury Surveillance System (NEISS-Work), and 2) periodic surveys of farm operators and workers. In 2004, there were an estimated 3.4 million nonfatal occupational injuries and illnesses treated in hospital emergency departments at a rate of 2.5 cases per 100 fulltime equivalent workers. Injuries and illnesses are not separately classified in NEISS-Work data; it is estimated that 90-95% of all cases are injuries. Workers aged less than 25 years had the highest rates.

Based on NIOSH/National Agricultural Statistics Service (NASS) surveys of farm operators in 2001 and 2004, there were an estimated 83,940 nonfatal injuries per year

among adults 20 years and older in agriculture production. The corresponding injury rate for the 2 years combined was 4.8/100 workers/year.

### **Emerging Issues**

NIOSH uses multiple on-going surveillance systems to identify significant emerging needs or trends associated with work-related traumatic injuries. These surveillance systems monitor fatal and nonfatal injury trends so that a proactive research response can be formulated to appropriately utilize scarce resources. NIOSH conducts fatality investigations of selected work-related deaths through the Fatality Assessment and Control Evaluations (FACE) program and also funds a State-based FACE program. The targets for investigation are shifted to address previously unaddressed problems and new problems as they emerge. These surveillance and investigation programs play a critical role in identifying significant emerging research areas that are especially relevant to the NIOSH traumatic injury research mission.

### **Relevant Priority Populations**

Occupational hazards are known to be distributed differentially, and workers of specific age, gender, social, and/or economic characteristics are more likely to have increased risks of work-related diseases and injuries. The relative proportions of high risk and vulnerable populations (such as older workers and minorities) within the U.S. workforce are increasing, and it is important to focus on these populations, particularly as they have been largely underserved in the past. Older workers are at greatly increased risk of work-related injury fatalities. Younger workers are also at increased risk of work-related injury because they often have limited job knowledge, training, and skills.

### **The Strategic Plan for the NIOSH Traumatic Injury Research and Prevention Program was developed to:**

- Focus program activities in directions that are likely to advance the program's mission
- Provide guidance to NIOSH intramural and extramural scientists when conceptualizing and planning research projects and activities
- Help management make decisions about the direction of the program given finite resources
- Plan program activities by taking into account external factors that impact the program and the stakeholders affected by the program, and
- Facilitate coordination of programs within the NIOSH portfolio

The NIOSH Traumatic Injury Research Program conducts surveillance, research and prevention activities to address occupational injuries and fatalities due to falls in the workplace, motor vehicle incidents, workplace violence, machines and industrial vehicles, and hazards among high risk and vulnerable worker groups.

The NIOSH Traumatic Injury strategic, intermediate, and activity/outcome goals are cross-referenced to relevant NORA Industry Sector Council strategic goals. The cross references are contained in brackets that immediately follow the goal statement. The following key provides the coding scheme for the cross-referencing citations:

Type of Goal	Abbreviation
Strategic Goal	SG
Intermediate Goal	IG
Activity/Output Goal	AOG

### **Definitions**

**Strategic Goal:** Strategic goals are the top-level goals in strategic plans. A strategic goal is a statement of a specific desired change in the social system. We strongly encourage the use of strategic goals that articulate reductions in occupationally-related illnesses, injuries, and/or hazardous exposures. *Example: Reduce work-related asthma in manufacturing industries.*

**Intermediate Goal:** Intermediate goals are the desired activities that organizations or individuals undertake with the research or public health practice outputs created by the program. If possible, an intermediate goal should state both the stakeholder actor and the research or public health output the stakeholder will use. *Example: Veteran's Administration hospital management will adopt recommended work practices to reduce WR asthma.*

**Activity/Output Goal:** Activity/Output goals are statements of desired program activities, including outputs and transfers to stakeholders. They include goals to create tools, controls, guidelines, training materials, recommendations, new knowledge, surveillance systems, documents, policies, conferences, etc. *Example: Complete study of productivity changes related to adoption of [proven control technology] by surgical services departments.*

**Bracketed reference numbers:** When appropriate, corresponding strategic goals from other NIOSH Sector and Cross-sector Programs are denoted following the TI Goal number for purposes of cross-reference and promotion of inter-Program coordination.

## **Strategic Goal 1 (09PPTRISG1): Reduce Fall Injuries in the Workplace**

### **Strategic Subgoal 1a (10PPTRISG1a): Reduce Fall Injuries in the Construction Industry [CON SG 1.0]**

*Intermediate Goal 1a.1 (10PPTRIIG1a.1): Construction organizations, engineers, architects, and employers in the construction industry will implement effective, evidence-based fall prevention and protection designs, technologies, programs, and communications materials for their structure design and at their worksites. [CON IG 1.1]*

**Activity/Output Goal 1a.1.1(10PPTRIAOG1a.1.1):**Collaborate with occupational safety professionals, trade associations, and safety equipment manufacturers to develop effective strategies, protective technologies, and personal protection equipment for preventing fall incidents and protecting workers. [CON IG 1.1]

**Activity/Output Goal 1a.1.2(10PPTRIAOG1a.1.2):**Collaborate with technology development organizations to test the feasibility of incorporating advanced technologies into existing elevation-access equipment to improve fall incident controls.

**Activity/Output Goal 1a.1.3 (10PPTRIAOG1a.1.3):** Collaborate with occupational safety professionals, trade associations, insurance companies, and other Government agencies to transfer fall prevention knowledge and innovations to employers. [CON r2pG 1.1.3; CON IG 1.2; CON r2pG 1.2.6]]

**Activity/Output Goal 1a.1.4 (10PPTRIAOG1a.1.4):** Collaborate with architect and engineering professional organizations to transfer safe-by-design innovations and knowledge to architects, engineers, and construction corporations to incorporate them in structure design and construction plans. [CON IG 1.4; CON r2pG 1.4.3; SG 13.0]]

*Intermediate Goal 1a.2 (10PPTRIIG1a.2): Safety research organizations, trade associations, insurance companies, and employers will identify, characterize, and reduce fatal and serious injuries associated with construction falls to a lower level among Hispanic construction workers. [CON SG 12.0]*

**Activity/Output Goal 1a.2.1 (10PPTRIAOG1a.2.1):**Explore and evaluate the effectiveness of new types of construction-tailored interventions to address Hispanic worker fall risks. These might include creative mechanisms involving community-based organizations, peer-to-peer networks, family-based measures, or similar efforts as well as policy initiatives. [CON RG 12.2.6]]



**Activity/Output Goal 1a.2.2 (10PPTRIAOG1a.2.2):** Transfer new knowledge and best practices on fall prevention to construction special trade contractors, general building contractors, small employers and companies who employ Hispanic construction workers. [CON IG 12.3]

**Activity/Output Goal 1a.2.3 (10PPTRIAOG1a.2.3):** Document effectiveness of implementation of fall prevention measures reflecting critical risk factors and obstacles to Hispanic construction workers.

## **Strategic Subgoal 1b (10PPTRISG1b): Reduce Fall Injuries in the Health Services Industry**

***Intermediate Goal 1b.1 (10PPTRIIG1b.1): The health services industry will implement comprehensive slip, trip, and fall (STF) prevention programs.***

**Activity/Output Goal 1b.1.1 (10PPTRIAOG1b.1.1):** Conduct intervention trials in health care settings to evaluate the effectiveness of STF prevention measures.

**Activity/Output Goal 1b.1.2 (10PPTRIAOG1b.1.2):** Develop hazard assessment checklists for use by the health care industry to identify STF hazards in health care settings addressing the most common STF hazards.

**Activity/Output Goal 1b.1.3 (10PPTRIAOG1b.1.3):** Develop evidence-based findings on how to implement a comprehensive slip, trip, and fall prevention program in health care settings that can serve as the basis of a national STF prevention campaign.

## **Strategic Subgoal 1c (10PPTRISG1c): Reduce Fall Injuries in the Wholesale and Retail Trade (WRT) Industry [WRT SG 2]**

***Intermediate Goal 1c.1 (10PPTRIIG1c.1): Engineers, WRT trade associations, and employers in the WRT industry will implement effective, evidence-based fall prevention and protection designs, technologies, programs, and communication materials for the handling, storage and retrieval of merchandise.***

**Activity/Output Goal 1c.1.1 (10PPTRIAOG1c.1.1):** Collaborate with researchers, WRT trade associations, worker groups, occupational safety and health professionals, and manufacturers of safety and health equipment to evaluate and develop effective strategies and technical engineering solutions for storage and retrieval of merchandise, goods, and materials to reduce fall-from-elevation incidents.

**Activity/Output Goal 1c.1.2 (10PPTRIAOG1c.1.2):** Collaborate with technology development organizations to test the feasibility of

incorporating advanced technologies into existing elevation-access and merchandise retrieval equipment to improve fall incident controls.

**Activity/Output Goal 1c.1.3 (10PPTRIAOG1c.1.3):** Collaborate with occupational safety professionals, WRT trade associations, and insurance companies to transfer fall prevention knowledge, innovations, and guidelines to the WRT industry and small business employers. [WRT IG 2.3]

## **Strategic Subgoal 1d (10PPTRISG1d): Reduce Fall Injuries in the Public Safety, Services, Manufacturing and other high risk Industries**

***Intermediate Goal 1d.1 (10PPTRIIG1d.1): Government agencies, vehicle and equipment manufacturers, standards committees, and occupational safety professionals will work together to improve the designs of ambulances, fire trucks, and heavy trucks to reduce the risk of injuries and fatalities associated with falls from these vehicles.*** [SPS IG 3.3; TWU IG 1.14]

**Activity/Output Goal 1d.1.1 (10PPTRIAOG1d.1.1):** Evaluate ingress/egress designs of ambulances, fire trucks, and heavy trucks; work with equipment manufacturers to review and consider design enhancement. [SPS TG 3.3.2; TWU 1.14.2]

**Activity/Output Goal 1d.1.2 (10PPTRIAOG1d.1.2):** Work with national standard groups to update or develop ingress/egress design standards for specific motor vehicles.

**Activity/Output Goal 1d.1.3 (10PPTRIAOG1d.1.3):** Develop and disseminate guidelines for ingress/egress use and modifications to reduce slips, trips, and falls among EMS personnel, firefighters, and truck drivers. [SPS TG 13.1.3; TWU 1.14.1]

***Intermediate Goal 1d.2 (10PPTRIIG1d.2): The food services industry and other high risk industries will implement comprehensive slip, trip, and fall (STF) prevention programs.*** [TWU IG 1.15, IG 1.18, IG 1.21; IG 1.23; IG 1.28]

**Activity/Output Goal 1d.2.1 (10PPTRIAOG1d.2.1):** Identify STF prevention strategies and research gaps that need to be addressed in the food services and other industries.

**Activity/Output Goal 1d.2.2 (10PPTRIAOG1d.2.2):** Develop and evaluate promising solutions for STF prevention in the food services industry.

**Activity/Output Goal 1d.2.3 (10PPTRIAOG1d.2.3):** Conduct intervention trials in the food services industry to evaluate the effectiveness of STF prevention measures.

**Activity/Output Goal 1d.2.4 (10PPTRIAOG1d.2.4):** Develop hazard assessment checklists for use by the food services industry to identify the most common STF hazards.

**Activity/Output Goal 1d.2.5 (10PPTRIAOG1d.2.5):** Develop evidence-based guidelines for preventing STF incidents in the food services industry that can serve as the basis of a national STF prevention campaign.

**Strategic Subgoal 1e (10PPTRISG1e): Reduce fall injuries through research on human characteristics and on biotechnology-based fall control measures.**

***Intermediate Goal 1e.1 (10PPTRIIG1e.1): Researchers will identify biomedical information of humans to design out fall risk or craft engineering solutions to control worker fall risk.***

**Activity/Output Goal 1e.1.1 (10PPTRIAOG1e.1.1):** Collaborate with other federal agencies to improve understanding of how individual worker characteristics contribute to fall incidents and to the design of effective fall protection devices. This should include exploration of physical variations, neurological traits, cognition process, social and cultural factors, and safety attitudes.

**Activity/Output Goal 1e.1.2 (10PPTRIAOG1e.1.2):** Study elderly workers' physical and cognitive constraints associated with falls and the mechanisms through which elderly workers at increased risk for fall injury, and develop a guideline to address risk of occupational fall as a result of decreased ability to perform their job tasks and respond to non-routine situations.

***Intermediate Goal 1e.2 (10PPTRIIG1e.2): Manufacturers will produce and market new, improved fall protection devices and systems that effectively reduce the forces to the human body during fall arrest and fall termination.***

**Activity/Output Goal 1e.2.1 (10PPTRIAOG1e.2.1):** Collaborate with manufacturers of safety equipment to test the effectiveness of new strategies, technologies, sensors (such as visual cue design and shoe characteristics and material properties) in reducing postural instability at elevation to reduce fall-initiation risk.

**Activity/Output Goal 1e.2.2 (10PPTRIAOG1e.2.2):** Collaborate with manufacturers of safety equipment to develop improved sizing systems

and configurations of fall protection devices to accommodate current worker population, including female workers, for improved fall protection.

**Activity/Output Goal 1e.2.3 (10PPTRIAOG1e.2.3):** Collaborate with manufacturers of safety equipment to develop improved devices or accessories for impact energy or stress relief (such as fall-arrest harnesses accessories to prevent the risk of suspension trauma) during and after a fall incident to further protect worker.

***Intermediate Goal 1e.3 (10PPTRIIG1e.3): Researchers, safety professionals, and safety investigators will use comprehensive digital models of human fall dynamics to evaluate new fall prevention and protection technologies, products, and methods and conduct fall injury investigations to recommend solutions.***

**Activity/Output Goal 1e.3.1 (10PPTRIAOG1e.3.1):** Develop knowledge databases for improving digital human models on fall dynamics, including the phases of fall initiation and fall termination, for use in efficient evaluation of new fall prevention and protection methods and strategies, in fall incident investigations (reconstruction), and in workers' hazard recognition training.

**Activity/Output Goal 1e.3.2 (10PPTRIAOG1e.3.2):** Transfer knowledge databases to digital model developers to develop scientifically comprehensive yet easy-to-use digital modeling modules for use in workplace planning for fall prevention, workers' hazard recognition training, and fall incident investigations.

**Strategic Goal 2 (09PPTRISG2): Reduce occupational injuries and deaths due to motor vehicle incidents and crashes [SPS SG 3, SG 6, SG12; WRT SG 4]**

***Intermediate Goal 2.1 (10PPTRIIG2.1): Industries and companies will incorporate effective interventions into their policies and procedures to reduce motor vehicle related incidents and crashes among professional drivers (i.e., those who drive as a primary job duty such as long- and short-haul truckers, intrastate drivers, day delivery drivers, and taxi drivers). [TWU IG 1.11]***

**Activity/Output Goal 2.1.1 (10PPTRIAOG2.1.1):** Identify risk factors for vehicle crashes among professional truck drivers (i.e., long-haul truckers) [TWU AOG 1.11.1].

**Sub Activity/Output Goal 2.1.1.1(10PPTRISAOG2.1.1.1):** Promote partnerships with other federal agencies during all phases of research related to professional truck drivers to ensure effective translation of research results.

**Activity/Output Goal 2.1.2 (10PPTRIAOG2.1.2):** Identify risk factors for vehicle crashes among professional drivers other than long-haul truckers (e.g., short-haul truckers, intrastate drivers, day delivery drivers, taxi drivers) and prioritize these subpopulations of drivers for targeted research efforts. [WRT AOG 4.2.2 through 4.2.6]

**Sub Activity/Output Goal 2.1.2.1(10PPTRISAOG2.1.2.1):**  
Promote efforts and research proposals addressing vehicle crashes among subpopulations of professional drivers (other than long-haul truckers) that were identified as highest priority [TWU IG 1.29; TWU AG 1.29.1 through 1.29.3; AFF IG 4.5; SRV SG 1].

**Sub Activity/Output Goal 2.1.2.2 (10PPTRISAOG2.1.2.2):**  
Promote NORA activities, both intramural and extramural, that focus attention on subpopulations of professional drivers (other than long-haul truckers), particularly subpopulations that were identified as highest priority.

**Activity/Output Goal 2.1.3 (10PPTRIAOG2.1.3):** Evaluate intervention strategies for their effectiveness in reducing work-related motor vehicle incidents and crashes. [WRT AOG 4.3.2]

***Intermediate Goal 2.2 (10PPTRIIG2.2): The road construction industry will incorporate effective interventions into their policies and procedures to reduce injuries and deaths due to vehicle and equipment related struck-by incidents [CON SG 3.0].***

**Activity/Output Goal 2.2.1 (10PPTRIAOG2.2.1):** Evaluate strategies to reduce ground worker exposures to road construction vehicles and equipment [CON IG 3.3].

**Sub Activity/Output Goal 2.2.1.1 (10PPTRISAOG2.2.1.1):**  
Evaluate existing engineering control strategies (internal traffic control plans and off-the-shelf proximity warning systems) [CON RG 3.3.1].

**Activity/Output Goal 2.2.2 (10PPTRIAOG2.2.2):** Promote the availability and use of operator visibility information for construction vehicles and equipment [CON IG 3.4].

**Sub Activity/Output Goal 2.2.2.1 (10PPTRISAOG2.2.2.1):**  
Make available blind area diagrams for selected construction vehicles and equipment used in the road construction industry [CON r2pG 3.4.1].

**Sub Activity/Output Goal 2.2.2.2 (10PPTRISAOG2.2.2.2):**  
Disseminate and promote the use of blind area diagrams for training equipment operators and ground workers who work around operating construction vehicles and equipment [CON r2pG 3.4.2].

**Activity/Output Goal 2.2.3(10PPTRIAOG2.2.3):** Evaluate worker injury risks associated with the expanded use of night work in the road construction industry [CON IG 3.5].

**Sub Activity/Output Goal 2.2.3.1 (10PPTRISAOG2.2.3.1):**  
Survey the industry on night work-related injuries [CON RG 3.5.1].

**Sub Activity/Output Goal 2.2.3.2 (10PPTRISAOG2.2.3.2):**  
Convene a workshop addressing night work in road construction to improve the understanding of injury patterns and risk factors [CON RG 3.5.2].

**Activity/Output Goal 2.2.4 (10PPTRIAOG2.2.4):** Gain widespread usage of effective prevention measures in the road construction industry [CON IG 3.6].

**Sub Activity/Output Goal 2.2.4.1 (10PPTRISAOG2.2.4.1):**  
Partner with road construction industry stakeholders and other federal agencies to widely disseminate effective practices for reducing injuries associated with vehicle and equipment related struck-by incidents [CON r2pG 3.6.1].

**Sub Activity/Output Goal 2.2.4.2 (10PPTRISAOG2.2.4.2):**  
Develop a strategy to use industry surveys to identify a baseline and a mechanism to track usage of prevention measures over the decade [CON r2pG 3.6.2].

**Activity/Output Goal 2.2.5 (10PPTRIAOG2.2.5):** Investigate, through the Fatality Assessment and Control Evaluation (FACE) Program, vehicle and equipment related deaths associated with road construction work zones.

**Sub Activity/Output Goal 2.2.5.1(10PPTRISAOG2.2.5.1):**  
Identify factors that contribute to vehicle and equipment related fatalities that occur in road construction work zones.

**Sub Activity/Output Goal 2.2.5.2(10PPTRISAOG2.2.5.2):**  
Develop and disseminate comprehensive recommendations for preventing similar deaths in road construction work zones.

***Intermediate Goal 2.3 (10PPTRIIG2.3): Industry will incorporate effective interventions into their policies and procedures to reduce motor vehicle related incidents and crashes among public safety and emergency response workers.***

**Activity/Output Goal 2.3.1 (10PPTRIAOG2.3.1):** Evaluate strategies to reduce incidents of vehicle related injuries and deaths among firefighters [SPS SG 3].

**Sub Activity/Output Goal 2.3.1.1 (10PPTRISAOG2.3.1.1):**  
Evaluate seatbelt use in fire service vehicles [SPS IG 3.1].

**Sub Activity/Output Goal 2.3.1.2 (10PPTRISAOG2.3.1.2):**  
Evaluate the effectiveness of policies and practices to reduce fatalities related to high-speed response and unsafe driving among fire service personnel [SPS IG 3.2].

**Activity/Output Goal 2.3.2 (10PPTRIAOG2.3.2):** Evaluate strategies to reduce incidents of vehicle related injuries and deaths among law enforcement personnel [SPS SG 6].

**Sub Activity/Output Goal 2.3.2.1 (10PPTRISAOG2.3.2.1):**  
Evaluate seatbelt use in law enforcement vehicles [SPS IG 6.1].

**Activity/Output Goal 2.3.3 (10PPTRIAOG2.3.3):** Evaluate strategies to reduce incidents of vehicle related injuries and deaths among emergency medical services (EMS) personnel [SPS Strategic Goal SG 12].

**Sub Activity/Output Goal 2.3.3.1 (10PPTRISAOG2.3.3.1):**  
Create and promulgate training programs to ensure safe operation of all ground vehicles through management and labor organization partnerships [SPS IG 12.1].

**Sub Activity/Output Goal 2.3.3.2 (10PPTRISAOG2.3.3.2):**  
Develop partnerships with vehicle and equipment manufacturers, EMS agencies, and other stakeholders and partners to improve the designs of all vehicle types used by EMS to decrease the risks of injuries and fatalities that result from vehicle crashes [SPS IG 12.2].

**Activity/Output Goal 2.3.4 (10PPTRIAOG2.3.4):** Investigate, through the Fire Fighter Fatality Investigation and Prevention Program (FFFIPP), vehicle related deaths among fire service and EMS personnel.

**Sub Activity/Output Goal 2.3.4.1 (10PPTRISAOG2.3.4.1):**  
Identify factors that contribute to vehicle related fatalities that occur among fire service and EMS personnel.

**Sub Activity/Output Goal 2.3.4.2 (10PPTRISAOG2.3.4.2):**  
Develop and disseminate comprehensive recommendations for preventing similar deaths among fire service and EMS personnel.

***Intermediate Goal 2.4(10PPTRIIG2.4): Global partners will collaborate to develop strategies for reducing occupational road traffic injuries worldwide***  
[GLC SG 3].

**Activity/Output Goal 2.4.1(10PPTRIAOG2.4.1):** Partner with the World Health Organization to include and promote occupational aspects of road safety in the WHO Global Road Safety Initiative [GLC IG 3.1].

**Sub Activity/Output Goal 2.4.1.1 (10PPTRISAOG2.4.1.1):**  
Develop an online library of international good practices for workers driving or walking on roads [GLC AOG 3.1.1].

**Sub Activity/Output Goal 2.4.1.2(10PPTRISAOG2.4.1.2):** Hold an international conference to solidify national and international partnerships and initiate actions to implement and evaluate practices in at least three countries [GLC AOG 3.1.2].

**Sub Activity/Output Goal 2.4.1.3(10PPTRISAOG2.4.1.3):**  
Publish a NIOSH/WHO document that describes international good practices for workers driving or walking on roads [GLC AOG 3.1.3].

**Activity/Output Goal 2.4.2 (10PPTRIAOG2.4.2):** Provide technical assistance to global partners developing international road safety initiative outputs to protect workers driving or walking on roads [GLC IG 3.2].

**Sub Activity/Output Goal 2.4.2.1 (10PPTRISAOG2.4.2.1):**  
Assist the UN Road Safety Collaboration and other global organizations [GLC AOG 3.2.1].

**Strategic Goal 3(09PPTRISG3): Reduce occupational injuries and deaths due to workplace violence**

**Strategic Subgoal 3a (10PPTRISG3a): Reduce occupational injuries and deaths due to workplace violence among taxicab drivers** [TWU IG 1.19]



***Intermediate Goal 3a.1 (10PPTRIIG3a.1): Industry will implement effective safety equipment in their taxicabs and transportation regulators will incorporate effective safety equipment into their ordinances to prevent injuries to taxi drivers resulting from physical violence.***

**Activity/Output Goal 3a.1.1 (10PPTRIAOG3a.1.1):** Develop partnerships with trade associations, police departments, taxicab companies, and community regulators for the development of and support to NIOSH research protocols for evaluation of safety equipment in taxicabs to prevent robberies, assaults and homicides.

**Activity/Output Goal 3a.1.2 (10PPTRIAOG3a.1.2):** Conduct research to identify risk factors for injuries to taxi drivers resulting from physical violence. [TWU AG 1.19.1]

**Activity/Output Goal 3a.1.3 (10PPTRIAOG3a.1.3):** Conduct research studies to demonstrate the effectiveness of safety equipment in taxicabs such as partitions, cameras, GPS and emergency alert systems, and cashless systems, and training programs to reduce robberies, assaults and homicides of taxicab drivers. [TWU AG 1.19.2]

**Activity/Output Goal 3a.1.4 (10PPTRIAOG3a.1.4):** Conduct research studies to demonstrate the effectiveness of model programs to increase adoption by the industry, transportation regulators, and drivers and their associations of effective safety equipment in cabs to reduce violence risk. Evaluate effectiveness of partnerships with regulators and industry to implement programs.

**Activity/Output Goal 3a.1.5 (10PPTRIAOG3a.1.5):** Develop partnerships with community transportation regulators, police departments and their associations, and taxicab associations to implement a model program in at least 1 community to increase the number of taxicabs compliant with effective interventions. [TWU AG 1.19.3]

**Activity/Output Goal 3a.1.6 (10PPTRIAOG3a.1.6):** Collaborate with industry, municipal and state transportation regulators, taxicab safety equipment manufacturers, and regulatory agencies to promote implementation of effective safety equipment nationwide to prevent injuries to taxi drivers resulting from physical violence. [TWU AG 1.19.3]

**Strategic Subgoal 3b (10PPTRISG3b): Reduce workplace violence among high risk retail trade workers including grocery stores, gasoline stations, convenience stores, bakeries, liquor stores, and other shops and businesses at risk of robbery. [WRT SG 3]**

***Intermediate Goal 3b.1 (10PPTRIIG3b.1): Retail businesses will implement NIOSH recommendations for effective security equipment, cash handling procedures, environmental designs, and employee training for behavior in a robbery event for prevention of robberies in their workplace and robbery-related injury in their workplace.***

**Activity/Output Goal 3b.1.1 (10PPTRIAOG3b.1.1):** Conduct research to evaluate successful models for diffusion of NIOSH and OSHA guidelines for prevention of robbery and robbery-related assaults and homicides to retail businesses. Different models will include evaluation of problem-oriented community policing model, health communication models, legislative models, and business self-certification programs. Research will be conducted to evaluate different approaches and partnerships using these diffusion models for increasing participation in training and education programs and compliance to recommendations.

**Activity/Output Goal 3b.1.2 (10PPTRIAOG3b.1.2):** Improve transfer, diffusion, and adoption of effective workplace violence interventions using proven diffusion models in high robbery-risk retail trade sector businesses. [WRT IG 3.3]

**Sub-Activity/Output Goal 3b.1.2.1 (10PPTRISAOG3b.1.2.1):** Utilize partnerships with employers, labor unions, trade associations, police departments and their associations, and federal agencies to increase the knowledge of workplace violence risks and potential strategies and interventions that limit risks in high risk wholesale and retail trade businesses.

**Sub-Activity/Output Goal 3b.1.2.2 (10PPTRISAOG3b.1.2.2):** Develop and implement communication plans for effective workplace violence intervention strategies that are demonstrated to have reached target audiences in the wholesale and retail trade sector.

**Sub-Activity/Output Goal 3b.1.2.3 (10PPTRISAOG3b.1.2.3):** Utilize and evaluate partnerships with employers, trade associations, government agencies, police departments and their associations, and crime prevention organizations to increase knowledge among police departments and implement a successful community policing program which increases business compliance to interventions and reduces robbery-related assaults in 3 communities.

**Activity/Output Goal 3b.1.3 (10PPTRIAOG3b.1.3):** Use reliable economic models to accurately assess the costs of fatal and non-fatal

injuries and illnesses from workplace violence and the potential savings from reducing incidence and severity of workplace violence events.

**Sub-Activity/Output Goal 3b.1.3.1 (10PPTRISAOG3b.1.3.1):**

Complete an assessment of reduction in costs due to implementation of a successful community policing program in one community.

**Sub-Activity/Output Goal 3b.1.3.2 (10PPTRISAOG3b.1.3.2):**

Disseminate return on investment and cost data to community partners to promote compliance to NIOSH and OSHA guidelines for retail workplace violence prevention.

**Strategic Subgoal 3c (10PPTRISG3c): Identify risk factors and effective interventions to prevent workplace violence among high risk services, health care, social service, and public safety sector workers**

such as eating and drinking establishment workers including pizza delivery services; hotels/motel workers; automotive repair mechanics; teachers and other high risk school workers; nurses and nursing assistants in general medical, home health care, nursing homes, and psychiatric hospitals; social service workers in job training, residential care, and day care industries; private security workers; and public safety and correctional workers in emergency response tasks (e.g., medical services and police calls and correctional officer activities). [SPS SG 7; IG 9.1; SRV SG 11]

***Intermediate Goal 3c.1 (10PPTRIIG3c.1): Industry will implement NIOSH recommendations for effective interventions to reduce workplace violence to high risk services, health care, and social service sector workers.***

**Activity/Output Goal 3c.1.1 (10PPTRIAOG3c.1.1):** Develop partnerships with industry, unions, and federal agencies in the development of and support to NIOSH protocols for research into workplace violence risk factors and evaluation of interventions in high risk services, health care, social service, and public safety sector workers.

**Activity/Output Goal 3c.1.2 (10PPTRIAOG3c.1.2):** Conduct studies to identify risk factors associated with physical trauma and verbal abuse (such as bullying, harassment and intimidation) from workplace violence among high risk services, health care, social service, and public safety sector workers. [SPS RG 7,1,2; RG 9.1.2]

**Activity/Output Goal 3c.1.3 (10PPTRIAOG3c.1.3):** Identify, develop, and evaluate effective interventions that reduce violence among high risk populations of workers in the high risk services, health care, social service, and public safety sectors. [SPS RG 7.1.4; RG 9.1.5; SRV IG 11.1, RG 11.1.2]

**Activity/Output Goal 3c.1.4 (10PPTRIAOG3c.1.4):** Improve transfer, diffusion, and adoption of effective workplace violence interventions in high risk services, health care, social service, and public safety sector workers. [SPS IG 7.2, TG 9.1.7, IG 9.2; SRV DG 11.1.3]

**Sub-Activity/Output Goal 3c.1.4.1 (10PPTRISAOG3c.1.4.1):** Utilize partnerships with employers, labor unions, trade associations and government agencies in the service sector to increase the knowledge of workplace violence risks and potential strategies to limit risks, and evaluate the effectiveness of these partnerships.

**Sub-Activity/Output Goal 3c.1.4.2 (10PPTRISAOG3c.1.4.2):** Develop and implement communication plans for effective workplace violence intervention strategies that are demonstrated to have reached target audiences in the range of small to large employers. [SPS TG 7.1.5, TG 7.1.3]

**Activity/Output Goal 3c.1.5 (10PPTRIAOG3c.1.5):** Use reliable economic models to accurately assess the costs of fatal and non-fatal injuries and illnesses from workplace violence and the potential savings from reducing incidence and severity of workplace violence events among service and public safety sector workers.

**Sub-Activity/Output Goal 3c.1.5.1 (10PPTRISAOG3c.1.5.1):** Disseminate return on investment and cost data to community partners to promote compliance to NIOSH and OSHA guidelines for workplace violence prevention in high risk service and public safety sectors.

## **Strategic Goal 4(09PPTRISG4): Reduce Occupational Injuries and Deaths due to Machines and Industrial Vehicles**

**Strategic Subgoal 4a (10PPTRISG4a): : Reduce occupational injuries and deaths in industries at high risk for mobile machine and industrial vehicle overturns.** [AFF IG 4.1]

*Intermediate Goal 4a.1 (10PPTRIIG4a.1): Government agencies, equipment manufacturers, and farming groups will work together in a prevention-through-design effort to increase the use of ROPS on tractors to an effective level in the agricultural production industry and other high risk industries.* [AFF IG 4.1]

**Activity/Output Goal 4a.1.1 (10PPTRIAOG4a.1.1):** Provide data to manufacturers on the effectiveness of cost-effective rollover protective

structures (CROPS) for existing ROPS retrofit programs (e.g. state programs).

**Activity/Output Goal 4a.1.2 (10PPTRIAOG4a.1.2):** Partner with manufacturers to provide cost-effective rollover protective structures (CROPS) for existing ROPS retrofit programs (e.g. state programs).

**Activity/Output Goal 4a.1.3 (10PPTRIAOG4a.1.3):** Partner with the NIOSH Agricultural Health Centers, equipment manufacturers, and other stakeholders to increase the percentage of farm tractors in the US equipped with ROPS to an effective level.

**Activity/Output Goal 4a.1.4 (10PPTRIAOG4a.1.4):** Partner with the USDA, National Agricultural Statistics Service (NASS) to continue monitoring the prevalence of ROPS-equipped tractors used on agricultural production establishments in the US.

***Intermediate Goal 4a.2 (10PPTRIIG4a.2): Government agencies, equipment manufacturers, and industry groups will work together in a prevention-through-design effort to increase the use of new ROPS technologies on mobile machines at high risk for overturns.***

**Activity/Output Goal 4a.2.1 (10PPTRIAOG4a.2.1):** Work with volunteer standards organizations to finalize the adoption of an AutoROPS standard for use on zero-turn mowers and similar mobile machines.

**Activity/Output Goal 4a.2.2 (10PPTRIAOG4a.2.2):** Partner with zero-turn mower manufacturers to transfer AutoROPS technology to the industry.

**Strategic Subgoal 4b (10PPTRISG4b): Reduce occupational injuries and deaths in industries at high risk for mobile machine and industrial vehicle non-overturn events. [AFF IG 4.2]**

***Intermediate Goal 4b.1 (10PPTRIIG4b.1): Government agencies, equipment manufacturers, and industry groups will work together in a prevention-through-design effort to decrease pedestrians being struck by mobile machinery and industrial vehicles. [AFF IG 4.2; CON IG 3.3; TWU IG 1.25]]***

**Activity/Output Goal 4b.1.1 (10PPTRIAOG4b.1.1):** Work with industry partners and other federal agencies to develop controls to reduce fatal injuries due to forklifts. [TWU AG 1.25.2]

**Activity/Output Goal 4b.1.2 (10PPTRIAOG4b.1.2):** Work with mining industry partners to develop interventions for preventing injuries related to machine safety and powered haulage equipment. [MIN IG 4.2]

**Activity/Output Goal 4b.1.3 (10PPTRIAOG4b.1.3):** Partner with the NIOSH Agricultural Health Centers, equipment manufacturers, and other stakeholders to decrease the deaths and injuries to pedestrians struck by farm tractors and other agricultural machines. [AG IG 4.2]

**Activity/Output Goal 4b.1.4 (10PPTRIAOG4b.1.4):** Disseminate to the commercial logging industry proven or promising prevention strategies to address key injury risk factors.

***Intermediate Goal 4b.2 (10PPTRIIG4b.2): Government agencies, equipment manufacturers, and industry groups will work together in a prevention-through-design effort to decrease other injury events caused by mobile machinery and industrial vehicles.*** [AFF IG 4.3; SRV IG 15.4]

**Activity/Output Goal 4b.2.1 (10PPTRIAOG4b.2.1):** Validate a computer simulation model to analyze the impact of dynamic loading of scissor-lifts for evaluating fall, collapse and tip-over incidents for use in improving equipment design and developing effective safety devices for adoption by equipment manufacturers.

**Strategic Subgoal 4c (10PPTRISG4c): Reduce occupational injuries and deaths in industries at high risk for stationary machine entanglements.** [AFF IG 4.3, IG 4.4]

***Intermediate Goal 4c.1 (10PPTRIIG4c.1): Government agencies, equipment manufacturers, and industry groups will work together to use existing technologies and training programs to prevent machinery entanglements.*** [AFF IG 4.3, IG 4.4]

**Activity/Output Goal 4c.1.1 (10PPTRIAOG4c.1.1):** Work with consensus standards committees and regulatory agencies on the adoption of new ANSI and ISO methods for machine risk reduction.

**Activity/Output Goal 4c.1.2 (10PPTRIAOG4c.1.2):** Work with small businesses to limit entanglement events.

**Activity/Output Goal 4c.1.3 (10PPTRIAOG4c.1.3):** Work with the mining industry to develop interventions, best practices, and strategies for

improving miners' training with respect to hazard recognition, risk factor awareness, and emergency response. [MIN IG 4.5]

***Intermediate Goal 4c.2 (10PPTRIIG4c.2): Government agencies, equipment manufacturers, and industry groups will work together in a prevention-through-design effort to evaluate and adopt new technologies to prevent machinery entanglements.***

**Activity/Output Goal 4c.2.1 (10PPTRIAOG4c.2.1):** Partner with the US Coast Guard and the commercial fishing industry to continue development of emergency-stop (e-stop) and other machine safety technologies.

**Activity/Output Goal 4c.2.2 (10PPTRIAOG4c.2.2):** Complete the testing and market development of passively controlling hazardous energy during un-jamming tasks on industrial machines for adoption by manufacturers.

**Activity/Output Goal 4c.2.3 (10PPTRIAOG4c.2.3):** Complete testing and market development of the NIOSH radio frequency (HASARD) device for passively controlling hazardous energy from worker proximity to conveyors and communicate the findings to manufacturers.

**Activity/Output Goal 4c.2.4 (10PPTRIAOG4c.2.4):** Work with manufacturers to investigate wearable sensor technologies for empowering the miner to take proactive steps in decreasing his/her exposure to work-related injuries. [MIN IG 4.3]

**Strategic Subgoal 4d (10PPTRISG4d): Reduce occupational injuries and deaths due to Machines and Industrial Vehicles through the Identification of New Hazards and Risk Factors.**

***Intermediate Goal 4d.1 (10PPTRIIG4d.1): Government agencies, equipment manufacturers, and industry groups will work together to analyze and evaluate surveillance data for deaths and injuries caused machinery and industrial vehicles.*** [AFF IG 4.3]

**Activity/Output Goal 4d.1.1 (10PPTRIAOG4d.1.1):** Characterize and track injuries and fatalities from machinery and industrial vehicles.

**Activity/Output Goal 4d.1.2 (10PPTRIAOG4d.1.2):** Identify and prioritize risk factors associated with machinery and industrial vehicles.

**Activity/Output Goal 4d.1.3 (10PPTRIAOG4d.1.3):** Identify work situations of high risk for machine-related fatal injury and develop prevention strategies for those who can intervene in the workplace by conducting Fatality Assessment and Control Evaluation (FACE)

investigations of targeted occupational fatality incidents in industries at high risk for machinery-related deaths.

***Intermediate Goal 4d.2 (10PPTRIIG4d.2): Government agencies, equipment manufacturers, and industry groups will work together to prioritize new research and intervention strategies based on machinery and industrial vehicles surveillance activities.***

**Activity/Output Goal 4d.2.1 (10PPTRIAOG4d.2.1):** Partner with high risk industries to identify and prioritize research and intervention programs for risk factors found to be associated with machinery and industrial vehicles.

**Activity/Output Goal 4d.2.2 (10PPTRIAOG4d.2.2):** Partner with regulatory agencies to identify and prioritize the development of new standards and employer programs based on machinery and industrial vehicles risk factors.

**Strategic Goal 5(09PPTRISG5):Reduce occupational injuries and deaths among high risk and vulnerable worker groups (*i.e., young workers, older workers, Hispanic workers, foreign-born workers, immigrant workers, workers with physical disabilities, day workers, and groups with injury rates that exceed the average for all workers and/or are increasing over time* ).**  
[AFF SG 2; CON SG 12.0; WRT SG 6]]

***Intermediate Goal 5.1 (10PPTRIIG5.1) Employers, trade organizations, governmental agencies, safety practitioners, safety advocates, community groups, educators and researchers will use occupational injury data and research to raise awareness of occupational safety problems among vulnerable worker groups (e.g., young workers, older workers, Hispanic workers, foreign-born workers), and to guide prevention and research efforts.***

**Activity/Output Goal 5.1.1(10PPTRIAOG5.1.1):** Develop and follow a schedule whereby existing injury surveillance data are analyzed and reported for vulnerable worker groups (e.g., young workers, older workers, Hispanic workers, foreign-born workers). These analyses will address injury burden, patterns, and trends. [AFF IG 2.2; CON IG 12.1]

**Activity/Output Goal 5.1.2 (10PPTRIAOG5.1.2):** Work with federal and state agencies and other external partners to facilitate the use of research findings on vulnerable worker groups in public and private sector intervention efforts. [AFF IG 2.4]

**Activity/Output Goal 5.1.3 (10PPTRIAOG5.1.3):** Target specific vulnerable worker groups (i.e., currently youth < 18 years of age and Hispanic workers, but other groups could be included in the future) for on-



site fatality investigations through the Fatality Assessment and Control Evaluation Program (FACE) and collect information on potential contributors to disparate risks, including informal and formal workplace policies and norms, work arrangements, and worker characteristics.

**Activity/Output Goal 5.1.4 (10PPTRIAOG5.1.4):** Meet and communicate regularly with the NIOSH Occupational Health Disparities Program and researchers funded by NIOSH to research vulnerable groups (e.g. state FACE programs, childhood agricultural injury researchers) to share findings and experiences, and identify opportunities for research and prevention collaborations.

**Activity/Output Goal 5.1.5 (10PPTRIAOG5.1.5):** Develop and disseminate occupational safety and health materials that are age, language and culturally appropriate. [AFF IG 2.4; CON IG 12.3]

***Intermediate Goal 5.2 (10PPTRIIG5.2): NIOSH and other research organizations will support risk factor and intervention evaluation research targeted to vulnerable worker groups (e.g. young workers, older workers, immigrant workers, workers with physical disabilities, day workers). [AFF IG 3.2; CON IG 12.2]***

**Activity/Output Goal 5.2.1 (10PPTRIAOG5.2.1):** Work with the NIOSH Occupational Health Disparities Program to explore partnerships to support risk factor research and intervention evaluations targeted at vulnerable worker groups (e.g. young worker, older workers, immigrant workers, workers with physical disabilities, day workers), including community participatory approaches.

**Activity/Output Goal 5.2.2 (10PPTRIAOG5.2.2):** Develop and seek funding for follow-back investigations and focused surveys of vulnerable worker groups (e.g. young workers, older workers, immigrant workers, workers with physical disabilities, day workers), in order to supplement existing surveillance data. [CON IG 12.1]

**Activity/Output Goal 5.2.3 (10PPTRIAOG5.2.3)** Develop and seek funding for risk factor, intervention and intervention evaluation research for vulnerable worker groups (e.g. young workers, older workers, immigrant workers, workers with physical disabilities, day workers). [CON IG 12.2]

**Activity/Output Goal 5.2.4(10PPTRIAOG5.2.4):** Work with the NIOSH Office of Extramural Programs to support extramural research to assess risk factors, evaluate interventions, and evaluate policies to prevent childhood agricultural injuries as part of the congressionally appropriated

childhood agricultural injury prevention initiative and disseminate findings to stakeholders.

**Activity/Output Goal 5.2.5 (10PPTRIAOG5.2.5):** Evaluate risk factors for workplace violence associated with high risk immigrant workers.

**Activity/Output Goal 5.2.6 (10PPTRIAOG5.2.6):** Evaluate the factors associated with fatal and non-fatal workplace violence incidents among youth worker populations in high risk services sector industries.

***Intermediate Goal 5.3(10PPTRIIG5.3): Employers, trade organizations, unions, governmental agencies, standards setting bodies, safety practitioners, safety advocates and researchers will use occupational injury research to raise awareness of occupational safety problems among high-risk worker groups (e.g., groups with injury rates that exceed the average for all workers and/or are increasing over time), and to guide prevention and research efforts. [CON IG 12.3]***

**Activity/Output Goal 5.3.1 (10PPTRIAOG5.3.1):** Work with federal agencies, trade associations, labor unions and other external partners to facilitate the use of research findings on high risk worker groups in public and private sector intervention efforts.

**Activity/Output Goal 5.3.2 (10PPTRIAOG5.3.2):** Conduct fatality investigations of line-of-duty fire fighter injury deaths through the Congressionally appropriated Fire Fighter Fatality Investigation and Prevention Program to identify contributory factors, including those associated with work organization and safety culture, and to develop recommendations for preventing future similar deaths.

***Intermediate Goal 5.4 (10PPTRIIG5.4): NIOSH and other research organizations will support risk factor and intervention evaluation research targeted to high risk worker groups (e.g., groups with injury rates that exceed the average for all workers and/or are increasing over time).***

**Activity/Output Goal 5.4.1 (10PPTRIAOG5.4.1):** Develop and seek funding for follow-back investigations and focused surveys of high risk worker groups (e.g. miners, fire fighters, emergency medical services workers, fishers), in order to supplement existing surveillance data.

**Activity/Output Goal 5.4.2 (10PPTRIAOG5.4.2):** Develop and seek funding for risk factor, intervention and intervention evaluation research for high risk worker groups (e.g. miners, fire fighters, emergency medical services workers, fishers).

**Strategic Goal 6 (10PPTRISG6): Increase the Use of Surveillance Data to Guide Occupational Traumatic Injury Research and Prevention Efforts. [AFF SG 1; CON SG 14.0; SRV SG 17]**

***Intermediate Goal 6.1(10PPTRIIG6.1): Employers, unions, regulatory agencies, safety practitioners and researchers will use occupational injury surveillance data to raise awareness of occupational safety problems and guide prevention and research efforts.***

**Activity/Output Goal 6.1.1(10PPTRIAOG6.1.1):** Partner with other federal agencies to analyze, modify or piggyback on their data collection systems and infrastructure to analyze and collect data on occupational injury deaths, nonfatal injuries, and hazards in a cost-effective manner.

**Activity/Output Goal 6.1.2(10PPTRIAOG6.1.2):** Work with the NIOSH Office of Extramural Programs to support, enhance and expand state-level occupational injury surveillance programs that use existing state-level occupational injury data for state-level prevention, and collect unique state-level data to guide prevention efforts and fill gaps in national occupational injury surveillance systems.

**Activity/Output Goal 6.1.3(10PPTRIAOG6.1.3):** Develop and follow a schedule whereby existing occupational injury surveillance data are analyzed and reported by NORA industry sector and event, to the greatest level of detail as supported by the data. These analyses will address injury burden, patterns, and trends. [AFF SG 1; SRV RG 17.1.3]

**Activity/Output Goal 6.1.4 (10PPTRIAOG6.1.4):** Provide relevant occupational injury surveillance data to OSHA, MSHA and the Wage and Hour Division of the Department of Labor upon request and in direct response to proposed rulemaking.

**Activity/Output Goal 6.1.5 (10PPTRIAOG6.1.5):** Disseminate occupational injury surveillance data and associated prevention recommendations, frequently in collaboration with state agencies and other partners. [AFF IG 1.3]

**Activity/Output Goal 6.1.6(10PPTRIAOG6.1.6):** Increase access to occupational injury surveillance data through the internet. [AFF IG 1.3]

**Activity/Output Goal 6.1.7(10PPTRIAOG6.1.7):** Provide technical assistance on collecting, analyzing and interpreting occupational injury surveillance data.

***Intermediate Goal 6.2(10PPTRIIG6.2): Policy makers, NIOSH, other federal agencies, and/or other statistical and research organizations will support research into the contributors to under-reporting of nonfatal occupational injuries, improvements to existing surveillance systems, and additional systems***

*that provide supplementary data on occupational fatal injuries, nonfatal injuries, hazards and use of control strategies.*

**Activity/Output Goal 6.2.1(10PPTRIAOG6.2.1):** Develop a prioritized list of research questions and promising research approaches to understand under-reporting and improve occupational nonfatal injury surveillance in conjunction with other federal agencies, statistical and research organizations, and academic researchers.

**Activity/Output Goal 6.2.2(10PPTRIAOG6.2.2):** Meet annually with the Bureau of Labor Statistics and OSHA to exchange information, coordinate surveillance activities, identify data gaps (including gaps in denominator data), and develop strategies to address these gaps.

**Activity/Output Goal 6.2.3 (10PPTRIAOG6.2.3):**Work with federal agencies, academicians and other internal and external partners to research innovative approaches to document the experience of worker groups who are not well-captured in the conventional occupational injury surveillance systems (e.g. immigrant workers, workers with disabilities, contract workers, day laborers, volunteers) and seek funding opportunities to further this research.

**Activity/Output Goal 6.2.4 (10PPTRIAOG6.2.4):** Meet annually with at least two other federal agencies to encourage the inclusion in data systems of standardized codes and narrative information on work-relatedness, occupation, industry, and circumstances of injury.

**Activity/Output Goal 6.2.5 (10PPTRIAOG6.2.5):** Work with federal and state agencies and other internal and external partners to explore the addition of economic burden variables to existing and under-development surveillance systems.

**Activity/Output Goal 6.2.6(10PPTRIAOG6.2.6):** Work with federal and state agencies and other internal and external partners to explore the addition of variables on personal protective technology and other control strategies in existing and under-development surveillance systems.

**Activity/Output Goal 6.2.7 (10PPTRIAOG6.2.7):** Develop and seek funding for surveillance research methods projects and projects that address NORA industry sector goals to improve industry sector-specific surveillance.

**Activity/Output Goal 6.2.8 (10PPTRIAOG6.2.8):** Work with the NIOSH Office of Extramural Programs and NORA Sectors to increase occupational safety surveillance research, including evaluations of existing

surveillance systems and methods, and the development of new approaches to occupational injury surveillance.